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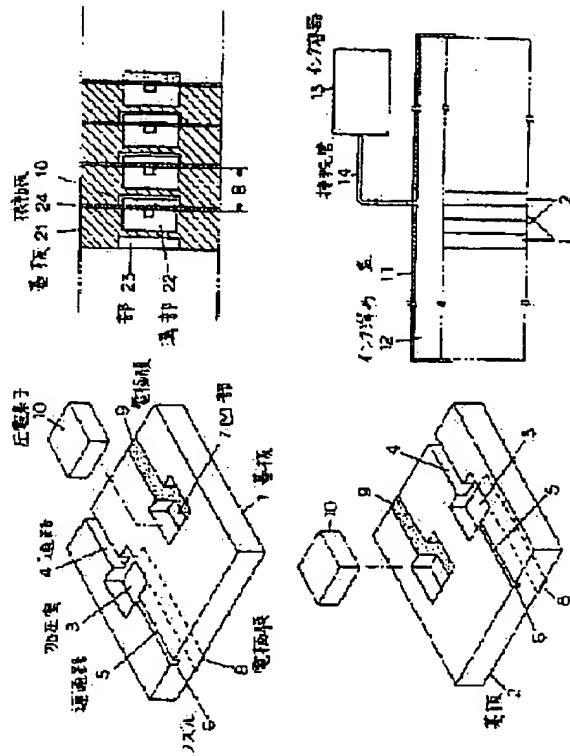
Title of invention: INK JET RECORDING HEAD

Abstract:

PURPOSE: To improve a printing speed and a printing quality by a method wherein a plurality of first base plates, each being provided with a groove through which a pressurizing chamber communicates to a nozzle, and a recessed part in which a piezoelectric element is accommodated and fixed, are alternately laminated and joined to a plurality of second base plates, each having a groove and a recessed part whose positions are opposite to those in the first base plate.

CONSTITUTION: When a voltage is applied to a piezoelectric element 10 in a base plate 2 through an electrode film 9 and an electrode film 8 in a base plate 1, the piezoelectric element 10 acts to a pressurizing chamber 3 in the base plate 1 and permits ink to be jetted. On the other hand, when a voltage is applied to the piezoelectric element 10 in the base plate 1 through the electrode film 9 and the electrode film 8 in the base plate 2, the piezoelectric element 10 acts to the pressurizing chamber 3 and permits ink to be jetted. Then, a group of the base plates joined together have a cover 11 on the upper side where respective passages 4 of the base plates are opened, and a common ink duct 12 is formed inside the cover 11, to which an ink vessel 13 is connected by means of a connecting tube 14. Further, a base plate 21 forms a combination of one groove 22 (consisting of a nozzle 6, the pressurizing chamber 3 and the passage 4), one piezoelectric element 10 provided in a position corresponding to the pressurizing chamber 3 via a vibrating plate 24, and a recessed part 23 to constitute a unit recording head. A predetermined plurality of unit recording heads are laminated and joined together to make a complete recording head.

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Other Drawings

(57)

[WHAT IS CLAIMED IS:]

[Claim 1]

On the other hand, It is located for Mizobe of the form which communicated with *no* face in access, pressurized room leading to ink receiver and branch and above pressurized room and parallel, it seems to be in face and equivalence face of above on the other hand piezoelectric element, a substrate of the first comprising pair with storing, adhered crevice; *no* Mizobe said with this the first substrate and the second substrate which take the form which crevice converted the lay to each other; Each same multiple pieces laminate *no* alternately, is joined, it is ink-jet record head including it seems to function, and division between *things* of base of above crevice of each substrate of dimension concerning direction of the laminating seems to cope with record amplitude and above *dai 1*, the second and the other face opposed to this being configured as a vibratory plate.

[Claim 2]

Ink-jet record head; wherein; In record head as claimed in claim 1, each substrate of *dai 1*, the second becomes from insulative material, and the other surface portion opposed to base of pressurized room is included, the first electrode film which, in addition, is formed in the surface of, The second electrode film formed base of crevice in the surface of an implication, on the other hand is comprised, the second above electrode film of either of each substrate of above *dai 1*, the second that it is adhered as for each piezoelectric element, The first above electrode film of a substrate of otherwise joined by one face of the substrate seems to be done in drawer conductor, and it is configured.

[Claim 3]

In record head as claimed in claim 1 or 2; Ink-jet record head; wherein; The ink receiver which is common to access of each substrate of *dai 1*, the second is connected, and it is become.

[Claim 4]

On the other hand, A substrate having pair with the crevice which above pressurized room is coped with in the surface of Mizobe and the other of the form which communicated with ink receiver of *no* face in connected access, pressurized room and branch, and is located; The vibratory plate which is joined in the surface of on the other hand of this substrate; The piezoelectric element which is adhered with an outer surface of this vibratory plate by lay corresponding to said pressurized room; Multiple pieces of unit comprising *o* laminate, is joined, it is ink-jet record head including being configured dimension concerning direction of the laminating seems to cope with record amplitude and and this and above piezoelectric element next to each other seem to be accommodated by each above crevice.

[Claim 5]

A substrate having Mizobe of the form which communicated with each face in access, the pressurized room which led to ink receiver and branch; The vibratory plate which is each joined by each face of this substrate; The piezoelectric element which is adhered with an outer surface of each this vibratory plate by lay corresponding to each said pressurized room; Multiple pieces of *o* unit to comprise laminate, is joined, the distance which each above piezoelectric element dimension concerning direction of the laminating seems to cope with record amplitude and is next to each other does not seem to touch is held, and it is ink-jet record head including it seems to be in equal distance, and each above branch being configured.

[DETAILED DESCRIPTION OF THE INVENTION]

[INDUSTRIAL APPLICATION FIELD]

The present invention relates to ink-jet record head of rest form arranged in only length corresponding to branch for, ink injection record amplitude line distance.

[PRIOR ART]

Ink-jet record it makes ink is jetted than minute branch, and this bond on a recording medium of paper, and to record is conventional and known in the art. And, There is on-demand mold ink-jet record head as one of the principle. Usually, Ink is collected in substrate 41 to become, and, in this kind of record head, 42, pressurized room 43, access 44, access 45, bezel comprising of branch 46 are formed in measure such as etch or machining as shown in an exploded perspective view of figure 7 by rustless steel or glass, by what, thereupon, vibratory plate (top board) 47 is repeated, and adhesion and diffusion are joined with, ink duct is configured. To a countersunk head, Part of and piezoelectric element 49 as an electric machine sensing element is bonded to face lay of vibratory plate 47 corresponding to pressurized room 43 vibratory plate 47 comprises bore 48 for ha ink supply. In addition, Electrode is formed in top and bottom surface of piezoelectric element 49, when an electrical signal is applied to this electrode, bias produces to piezoelectric element 49, and vibratory plate 47 is displaced. As a result, Cubic content of pressurized room 43 decreases, an ink drop is jetted from branch 46 hereby, and a record is done.

[PROBLEM TO BE SOLVED BY THE INVENTION]

It is necessary to do an ink drop to discharge than record head in a diameter of 100-150 mu m degree to do good record in ink-jet record head shown to figure 7, it is necessary, for this reason, equivalent diameter 50 of ink branch is done after in front of mu m and to extremely lift the dimension accuracy. In addition, Of course, distance of branch (lattice parameter) is highly precise, too, and it must be held. To a countersunk head, It is desirable ink printing quality that is for space of branch is small as possible from the viewpoint of *kokaizoudoka*. Even if when rustless steel described by prior art or glass is used to a substrate, mu m front and back dispose this in the shape of chessboard patterns in bill of a substrate, each face of flesh side in end about 250 ink branch distance from constraint of processing technique, the resolution is 180dpi (the number of the dot of 1 inch under break). And, Ink branch number is usually 12 or 24 of them, too. Therefore, Formula making run only distance corresponding to amplitude recording the record head with an ink-jet printer based on conventional record head is asked. To an ink-jet printer of this travel formula (1), drive assembly for use in travel is requirement (2), while making run, because it is *no* printing, it might air is rolled up by means of inertia when printing speed stopped from travel limited by a certain cross level (3), and be in ink injection inability or even if it is jetted, there is issue of - falling the printing quality which, in brief, accuracy was included in which is out of adhesion lay of ink (printing lay) from regular lay. An assignment of this invention cancels the above-mentioned problems that prior art: has, it is to provide ink-jet record head of the rest form which improvement of printing speed and printing quality can plan.

[MEANS TO SOLVE THE PROBLEM]

Ink-jet record head concerning claim 1 is located for Mizobe of the form which communicated with ink receiver in connected access, pressurized room and branch and the pressurized room and parallel in the surface of on the other hand to solve this assignment, it seems to be in face and equivalence face of the on the other hand piezoelectric element, a substrate of the first comprising pair with storing, adhered crevice; The second substrate which takes the form that crevice changed the lay for Mizobe with this the first substrate each other; Each same multiple pieces laminate *no* alternately, is joined, it seems to function, and division between *things* of base of a recess of each substrate of dimension concerning direction of the laminating seems to cope with record amplitude and *dai* 1, the second and the other face opposed to this is configured as a vibratory plate. Each substrate of *dai* 1, the second suffers from ink-jet record head concerning claim 2 from insulative material in record head as claimed in claim 1, and the other surface portion opposed to base of pressurized room is included, base of the first electrode film and

crevice which, in addition, is formed in the surface of is included, the second electrode film formed in the surface of on the other hand is comprised, it seems to do the first electrode film of a substrate of otherwise joined with face of the second electrode film of either of each substrate of adhered *dai* 1, the second and on the other hand of the substrate in drawer conductor, and each piezoelectric element is configured. The ink receiver which is common to access of each substrate of *dai* 1, the second is connected, and, as for the ink-jet record head concerning claim 3, it is in record head as claimed in claim 1 or 2. A substrate having association with the crevice which ink-jet record head concerning claim 4 copes with the process chamber in the surface of Mizobe and the other of the form which communicated with ink receiver in connected access, pressurized room and branch in the surface of on the other hand, and is located; The vibratory plate which is joined in the surface of on the other hand of this substrate; The piezoelectric element which is adhered with an outer surface of this vibratory plate by lay corresponding to the pressurized room; Multiple pieces of unit comprising *o* laminate, is joined, it is configured dimension concerning direction of the laminating seems to cope with record amplitude and and this and the piezoelectric element next to each other seem to be accommodated by each crevice. The substrate which has Mizobe of the form which communicated with ink receiver in connected access, pressurized room and branch in each face ink-jet record head concerning claim 5; The vibratory plate which is joined each face each with of this substrate; The piezoelectric element which is adhered with an outer surface of each this vibratory plate by lay corresponding to each pressurized room; Multiple pieces of unit comprising *o* laminate, is joined, the distance which each piezoelectric element dimension concerning direction of the laminating seems to cope with recording layer and is next to each other does not seem to touch is held, and it seems to be in equal distance, and each branch is configured.

[OPERATION]

Each branch is arranged along line for commonness in record head concerning either of claim 1 - 3 by distance, even number of branch column of length corresponding to record amplitude can move branch of each line next to each other by half lattice parameter, and is formed. Application of a voltage to piezoelectric element is done by means of each electrode film of *dai* 1, the second in record head concerning claim 2 in particular. In record head concerning claim 3, ink is supplied by the ink receiver which is common to each all Mizobe. Each branch is arranged along line for commonness in record head concerning claim 4 or 5 by distance, 1 or two above of branch column of length corresponding to record amplitude prepares branch lattice parameter of the each line, and is formed.

[EXAMPLE]

Embodiment of record head concerning the present invention is explained when read in conjunction with the accompanying drawings in the following. Exploded perspective view of one board that figure 1 composes the first embodiment concerning the present invention, figure 2 are exploded perspective views of a substrate of the otherwise identically. In figure 1, pressurized room 3, access 4, communication path 5 and Mizobe comprising of branch 6 and crevice 7 is formed in the surface of the on the other hand to substrate 1 corresponding to the first substrate in invention. In addition, Crevice 7 stands in a row to pressurized room 3, and it is disposed. Piezoelectric element 10 seems to become face same as face of substrate 1, and, to this crevice 7, it is adhered storing. In addition, Substrate 2 shown in figure 2 corresponding to the second substrate in invention changed lay with Mizobe and crevice 7 in substrate 1. Each substrate 1,2 are produced by means of injection molding by acryl resin. Dimension is caliper $\frac{1}{2} \sim$ length $\frac{1}{2} \sim$ side = $0.14 \times 25 \times 25$ (mm). Next, 8,9 are equivalent to each electrode film of *dai* 1, the second in invention, it is caliper formed in the surface of each substrate by a spatter method: It is film of about 3000A gold. Electrode film 8 includes division of face of the backside opposed to base of pressurized room 3 in cingulate, and it lengthens to this side side. In addition, In cingulate, division of base of crevice 7 is included, and electrode film 9 passes through an internal perimeter surface, and it lengthens to the other party of face of a face. Each this electrode film 8,9 are bonding conductor from

each electrode of piezoelectric element 10 that is leaders to be described below in detail. Each substrate 1,2 laminate as shown in figure 3 alternately, is joined. Elevation of the first embodiment, figure 4 are alignment of the first embodiment figure 3. In figure 3, caliper A of each substrate 1,2 prescribes branch lattice parameter that is resolution, $A = 0.14\text{mm}$ of this case are resolution: 180dpi is supported. In a place, Because, in the event of paper for A4, record width is 196mm, only 1390 total number of each substrate 1,2 is necessary. Laminating adhesively bonds each board 1,2 alternately, and two-dot chain line designation in figure 3 is contour of finished substrate group. In addition, As for the adhesion between each substrates, attaching to by *mechiruisopuchirukuton* medium and substrate crevice of a piezoelectric transducer depend on epoxy system adhesive. For this case, At $L = 196\text{mm}$, branch 6 is lattice parameter in consonance with the top, cross direction line of lower two steps respectively: It is arranged in the shape of chessboard patterns at 0.14mm. In figure 3, action of each piezoelectric element 10 of bias hunting designation is described. For example, Piezoelectric element 10 of substrate 2 on the left hand side of graphic display goes through electrode film 9 coming in contact with the left side surface and electrode film 8 of the left side surface of substrate 1 of of the right side of graphic display, and is applied, it acts on as against pressurized room of substrate 1 of on the left hand side of graphic display, it makes jet ink. In addition, Piezoelectric element 10 of substrate 1 of one of the right side of graphic display goes through the left side surface and electrode film 9 touching and electrode film 8 of the left side surface of substrate 2 of of the right side of graphic display, and is applied, it acts on as against pressurized room of substrate 2 of on the left hand side of graphic display, it makes jet ink. Next, An adhesively bonded substrate crowd pours cap 11 over upside of the figure which each access (figure 1, four access reference of figure 2) opens as shown in figure 4, ink common in that is collected, and 12 is formed. And, Connecting duct 14 is gone through, and, to this cap 11, ink container 13 is joined together, and record head can leave inertia. In addition, In this the first embodiment, it is applied voltage: When 120V are supposed to be, ink can be jetted to frequency 3kHz. This situation is confirmed. In a place, In the first embodiment, Mizobe and a lot with crevice are formed to each substrate 1,2 respectively, but , as for this pair, countersunk heads can increase. The number of this pair is decided by means of each factor such as printing content, printing speed, a degree of difficulty of control. Figure 5 is cross section of the second embodiment. The second embodiment makes piezoelectric element 10 of one which vibratory plate 24 is gone through, and is installed in one Mizobe 22 (comprising of branch, pressurized room, access) and lay corresponding to this pressurized room and pair with crevice 23 to substrate 21, this is done with record head of unit. Predetermined multiple pieces, laminating join this unit record head, and record head is finished. In addition, Pressure simple child 10 becomes a form taken to crevice 23 next to each other. The second embodiment has branch line of one line in cross direction, the branch lattice parameter is B of the figure above. Figure 6 is cross section of the third embodiment. The third embodiment makes one Mizobe 32 (comprising of branch, pressurized room, access) in each face of substrate 31, vibratory plate 34 is gone through, and piezoelectric element 10 is established in lay corresponding to each pressurized room of both sides, this is done with record head of unit. Only multiple pieces to be predetermined in this unit record head go through filler block 35, piezoelectric element 10 next to each other does not seem to touch and it seems to be in equal distance branch, appointed distance is asked, and laminating is joined, and it is completed in record head. The third embodiment has branch line of one line in cross direction, the branch lattice parameter is C of the figure above. Each the branch lattice parameter B, C is structural, and, in each embodiment of *dai* 2, the third, there is defect named increasing *NONIF than branch lattice parameter A in the first embodiment, but, because it is on the basis of conventional record head, it is easy to be produced, dependability is high. In a place, In each embodiment of *dai* 2, the third, all comprises branch line of one line, but , as for this line number, countersunk heads can increase. The first point decided by means of each factor such as the content which the number of this line prints, printing speed, a degree of difficulty

of control is similar for the case embodiment.

[EFFECT OF THE INVENTION]

Is arranged along line for commonness in record head concerning either of claim 1 - 3 by distance, multiple pieces of branch column of length corresponding to record amplitude can move branch of each line next to each other by half lattice parameter, and is formed, it is possible, besides, to be small in branch lattice parameter of each line. Therefore, By means of being rest form, improvement of printing speed and printing quality plan. Because application of a voltage to piezoelectric element is done by means of each electrode film of *dai* 1, the second in record head concerning claim 2 in particular, configuration is simple, and *syokeika* plan and an assembly operation becomes easy. Because ink is supplied in record head concerning claim 3 by the ink receiver which is particularly common to each all Mizobe, it becomes easy, and an assembly operation becomes easy, and configuration can plan *syokeika*. Is arranged along line for commonness in record head concerning claim 4 or 5 by distance, because 1 or two above of branch column of length corresponding to record amplitude prepares branch lattice parameter of each line, and is formed , by means of assembling of rest form, improvement of printing speed and printing quality can be planned. Because, in record head concerning claim 5 in particular, two branch is formed by each substrate, it can make the number of a substrate is compared with a thing concerning claim 4, and reduce to half.

[BRIEF DESCRIPTION OF DRAWINGS]

Cross section of the third embodiment, figure 7 are exploded perspective views of conventional embodiment cross section of the second embodiment, figure 6 alignment of the first embodiment, figure 5 elevation of the first embodiment, figure 4 exploded perspective view of a substrate of the otherwise, figure 3 exploded perspective view of one board composing the first embodiment concerning the present invention, figure 2 figure 1 identically. Character account 1,2,21,31: Substrate, 3:00 Pressurized room, 4:00 Access, 5:00 Communication road, 6:00 Branch, 7,23: Crevice, 8,9: Electrode film, 10:00 Piezoelectric element, 11:00 Cap, 12:00 Ink receiver, 13:00 Ink container, 14:00 Connecting duct, 22,32: Mizobe, 24,34: Vibratory plate, 35:00 Filler block.